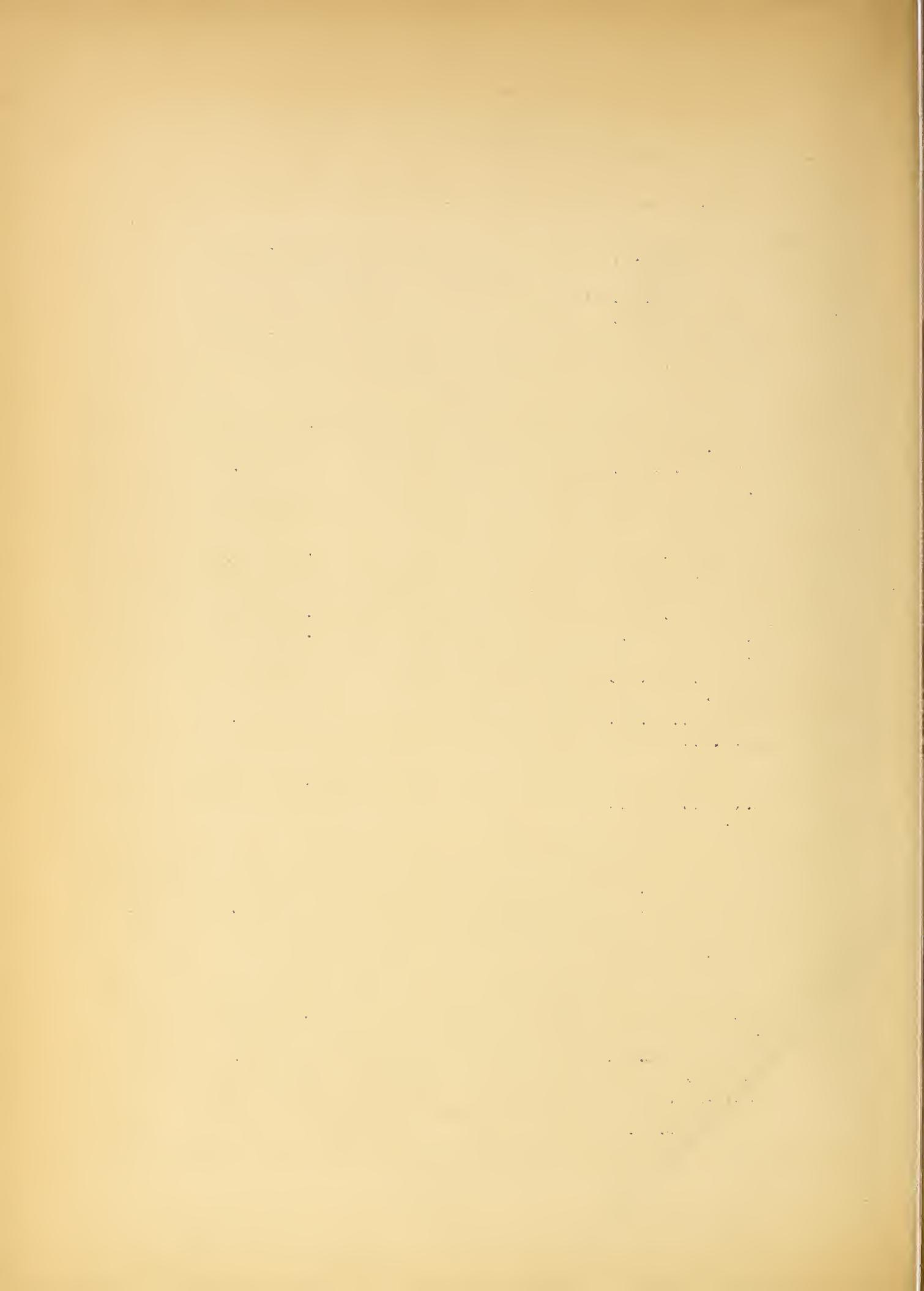


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THE FIELD STATUS OF PARASITES OF THE EUROPEAN CORN BORER  
AT THE CLOSE OF THE 1942 SEASON

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INTRODUCTION

Collections of overwintering larvae of the European corn borer were made at the close of the 1942 season to determine the field status of parasites in localities where exotic species were known to be established or where recent releases had been made. The objective of this survey was to obtain basic information on establishment, dispersion, and increase of introduced parasites, and on other factors of value in planning and conducting a general program for colonization of corn borer parasites. The recoveries made from these collections, of the 22 species that have been imported and released since the inception of this activity in 1919, are summarized in table 1.

STATUS OF PARASITES

Vermont:

Very limited collections were made in six localities in Vermont to determine possible establishment of parasites from releases made during the period 1935 to 1938. No introduced parasites of the corn borer were recovered, therefore none are known to be established in the State of Vermont.

Middlesex, Mass.:

Locality surveyed: Three areas in Middlesex County, northwest of Boston, each covering 12 square miles, or a total of 36 square miles.

Parasitization of overwintering borers was only 4.5 percent, as determined by the rearings made. This is the lowest rate of parasitization recorded for this locality since 1927 and represents a further drastic reduction from the low of 7.7 percent recorded at the close of 1941. The parasite showing the greatest reduction was the ichneumonid Inareolata punctoria Roman, which had parasitized only 3.5 percent of

the borers observed. Lydella grisescens R.D. was present in all three study areas, but had parasitized fewer than 1 percent of the hosts observed in any one area. A recovery of possible importance was two host specimens parasitized by the polyembryonic braconid Macrocentrus gifuensis Ashm. The recovery showed maintenance of this parasite here from the release of the species at Concord, Mass., in 1940.

Table 1.—Summary of European corn borer parasitization in various localities at the close of 1942

Locality	Area surveyed Sq. mi.	Hosts obs- served	Number	Parasitization by—					
				Inaneolata grisescens	Lydella punctoria	Macrocentrus gifuensis	Eulophus annulipes	Total 1/ Percent	Total 1/ Percent
New England:									
Southeastern -----	4,800	2,647	1.8	1.6	8.5	0 2/	0	11.9	
Massachusetts:									
Middlesex County -----	36	1,813	.6	3.5	.1	0	0	4.2	
Massachusetts and Connecticut:									
Southern Connecticut									
River Valley -----	2,825	2,929	1.7	5.9	•3	0.1	0	8.0	
Vermont: 2/	3/	689	0	0	- 4/	0	-	0	
New Jersey:									
Burlington County -----	254	3,022	17.5	11.2/	0	0	-	17.5	
Monmouth County -----	154	1,539	3.9	1.7	2.7	0	-	8.3	
Virginia:									
Accomac County -----	24	1,074	.6	0	0	0	-	•6	
Princess Anne County ---	7	520	21.3	0	0	0	-	21.3	
Ohio:									
Erie County -----	7	404	29.5	0	0	0	0.5	30.0	
Lucas County -----	12	590	24.6	0	0	0	1.5	26.1	
Michigan:									
Monroe County -----	7	290	28.3	0	0	0	0	28.3	
Indiana:									
Tipton County -----	6/	402	-	0	0	-	-	0	
Illinois:									
Vermilion County -----	6/	395	-	0	0	-	-	0	
Wisconsin:									
Sheboygan County -----	6/	144	0	0	0	-	-	0	

1/ In addition, a few native parasites were collected from most of the localities.

2/ 0 = Release but no current recovery.

3/ Includes limited collections only from Chittenden, Grand Isle, Rutland, Washington, Windham, and Windsor Counties.

4/ - = No release in locality.

5/ T = Trace, less than 0.1 percent of parasitization.

6/ First releases in 1942; limited collections to determine initial establishment.

Southeastern New England:

Locality surveyed: The area enclosed by the northern boundary of the State of Massachusetts from the Atlantic coast west to Winchendon, then directly south through Brookfield and Sturbridge, Mass., to the Connecticut State line, thence east along the northern boundaries of Connecticut and Rhode Island to the city of Woonsocket, R. I., thence south through Kingston, R. I., to Long Island Sound, and along the coast back to the starting point, with the exception of the tip of Cape Cod above the town of Eastham. The total area within these boundaries is approximately 4,800 square miles. In this extensive area borer parasitization was found to average 12.0 percent. It varied considerably in different parts of the surveyed area, however, because of the uneven distribution of the exotic parasites.

Corn borer larvae collected from an area of 2,000 square miles in southeastern Massachusetts showed a parasitization of 19.7 percent. For comparison with the two previous years see table 2.

Table 2.--Parasitization of the European corn borer in southeastern Massachusetts at the close of the years of 1940-42

Year	Hosts observed	Parasitization by--					Chelonus annulipes	Total
		<i>Lydella grisescens</i>	<i>Inareolata punctoria</i>	<i>Macrocentrus gifuensis</i>				
		Number	Percent	Percent	Percent			
1940	4,345	9.6	2.8	17.1		0.8	30.3	
1941	1,932	6.0	1.2	8.4		.5	16.1	
1942	1,291	2.8	.5	16.4		0	19.7	

It will be seen that the exotic Macrocentrus gifuensis was the most important parasite and that an increase in its abundance is indicated by a borer parasitization of 16.4 percent in the fall of 1942, as compared with 8.4 percent at the close of 1941. Seventeen of the 56 collections had over 10 percent of the borers parasitized by this species and 12 of these showed a parasitization of over 20 percent. This species has also extended its range, having been recovered near the towns of Grafton and Uxbridge, in Worcester County, Mass. It had also crossed Narragansett Bay and was recovered near Wickford Junction, in southern Rhode Island.

A reduction in the effectiveness of Lydella grisescens, Inareolata punctoria, and Chelonus annulipes is indicated, continuing a trend evident for the last 3 years. Borer parasitization by the two first-named species in 1942 was only half what it was in 1941 and not a single specimen of the last-named species was recovered in 1942. It has been suggested that the reduction in effectiveness of these three parasites following the increase of Macrocentrus gifuensis may be a result of competition between parasites, but no data are available on this point.

Connecticut River Valley:

Locality surveyed: Because of the increased dispersion of two exotic parasites, Inareolata punctoria and Lydella grisescens, the area surveyed in the fall of 1942 was increased to cover 2,825 square miles. It consisted of a strip extending from Long Island Sound north through central Connecticut and south-central Massachusetts as far as the town of Sunderland, Mass., and extending out from 15 to 25 miles on each side of the Connecticut River. A total of 8.3 percent of the 2,929 borers observed from this extensive area were parasitized.

The introduced ichneumonid Inareolata punctoria was the most common parasite encountered. It was reared from 44, or two-thirds of the 66 collections made. Parasitization in individual collections ran as high as 30 percent, being highest within 15 miles of the point of first establishment and decreasing as the distance from the release point increased. I. punctoria was recovered from 3 of the 4 collections made near Milford, Conn., where releases of this species were made in 1934 and 1935. This represents a separate establishment of this parasite in that State, again confirming previous records.

The tachinid Lydella grisescens is widely distributed throughout the lower Connecticut River Valley, being present from Middletown, Conn., north to Amherst, Mass. Borer parasitization by this fly is low, however -- rarely above 10 percent in this area.

The egg-larval parasite Chelonus annulipes was recovered from three collections, near the town of Somers in Tolland County, near Windsorville, in East Windsor Township, Hartford County, and near Mount Carmel, in Hamden Township, New Haven County, Conn. This species shows no indications of increasing but still persists in the locality after establishment from extensive releases made in 1939.

The braconid Macrocentrus gifuensis was reared from four collections obtained in Connecticut--near Columbia, in Tolland County; at Marlboro, in Hartford County; at Portland, in Middlesex County; and at Milford, in New Haven County. The recovery of this parasite from the three first-named areas represents a second confirmation of its establishment, maintenance, and rapid dispersal from a release made at Haddam, Conn., in 1940. The recovery from Milford represents a first record for the species from that area where the parasite was released in 1940.

Atlantic Township, Monmouth County, N. J.:

Locality surveyed: A central circle 2 miles in diameter (section 1) with its center at the parasite release point 1 mile west of Colts Neck, in Atlantic Township, Monmouth County. The central circle was surrounded by three concentric rings (sections 2-9, 10-25, and 26-41), each 2 miles wide. Total area surveyed, 15<sup>1</sup>/<sub>4</sub> square miles.

The parasites reared from borers collected in the Atlantic Township (Colts Neck) locality at the end of 1942 were all introduced species. The most numerous and widely dispersed species was the tachinid Lydella grisescens, which was also the first exotic parasite of the borer released in the locality. Although it was still the leading parasite in the locality, the indications were that it was less effective in 1942, with an observed parasitization of only 3.9 percent of its hosts, than in 1941, when 8 to 10 percent of the hosts observed had been parasitized by it.

The ichneumonid Inareolata punctoria was less effective in 1942 than in 1941 in the central part of the surveyed area. In comparable collections made in the 2 years, parasitization of the borers observed dropped from 4.3 percent in 1941 to 1.4 percent in 1942. This was offset, however, by the known dispersal of the parasite into previously unoccupied territory. This solitary ichneumonid is not very effective as yet and the highest parasitization recorded to its credit in 1942 was only 11.8 percent.

The more recently introduced parasite, Macrocentrus gifuensis, continues to increase in numbers and disperse into new areas. In 1941 it was not found more than 3-1/2 miles from the release point. In 1942 it was reared from seven collections made approximately 4 miles and one collection made 6 miles from the point of release. Parasitization by M. gifuensis of borers in collections made in comparable territory during the 2 years was 1.3 percent in 1941 and 5.9 percent in 1942; however, the parasite is not yet abundant enough to show many high concentrations, although in one collection parasitization was 20.8 percent.

Burlington, N. J.:

Locality surveyed: A central circle 2 miles in diameter (section 1) with its center at the parasite-release point in Burlington Township, Burlington County. This central circle was surrounded by four concentric rings (sections 2-9, 10-25, 26-41, and 42-57), each 2 miles wide. Total area included, 254.5 square miles.

As in 1941, so also in 1942 only a single specimen of Inareolata punctoria was reared from the 3,022 host larvae observed from the Burlington locality. This specimen was reared from the hosts in collection No. 1, taken at the point of parasite release.

A single host larva parasitized by Macrocentrus gifuensis was also collected at the parasite-release point in Burlington Township. This species has been taken at this release point in previous surveys, but as yet shows no sign of increasing in abundance.

The parasite longest established in the Burlington locality is the tachinid Lydella grisescens. This parasite killed 17.5 percent of the hosts observed over the 254 square miles included in the surveyed area. Only 5 of the 57 collections made failed to produce this species and these 5 were made at the perimeter of the surveyed area. Twenty-one

collections showed a parasitization of over 20 percent by the tachinid and the collection at the parasite-release point in the heart of the surveyed area showed 58.6 percent of the borers killed by *L. grisescens*. Collections made within the central 78 miles showed 23.9 percent of the borers parasitized in 1942, as compared with 20.7 percent in a slightly smaller area surveyed at the close of 1941. The greatest increase in effectiveness of this parasite, however, took place in more outlying sections, which it had occupied at a later date.

Lee-Onley, Va.:

Locality surveyed: Evaluation study areas A and B, located in Accomac County on the "Eastern Shore" of Virginia. Each area is 3 to 4 miles in size. Area A is located 3 miles northeast of the town of Onley and area B is 3 miles southwest of this town. Total area surveyed, 24 square miles.

The only parasite reared from the 1,074 host larvae observed from the Lee-Onley, Va., locality was the fly *Lydella grisescens*, and only 6 specimens of this parasite were reared. It is evident that, although this parasite is still present in the locality, the parasitization of the borer to the extent of only 0.6 percent could not be of much importance.

Princess Anne, Va.:

Locality surveyed: A central circle (section 1) 1 mile in diameter with its center at the parasite-release point in Princess Anne County. This central circle was surrounded by a concentric ring (sections 2-9) 1 mile wide. Area surveyed, 7 square miles. Two supplementary collections, Nos. 10 and 11, were made 3 and 5 miles, respectively, from the parasite-liberation point.

Apparently only one species of corn borer parasite is established in Princess Anne County from releases made in 1941 at Back Bay. This parasite, *Lydella grisescens*, has not only become well established but has become abundant and is spreading rapidly. Because of the difficulty of associating parasite puparia found in the field with any one of the three overlapping generations of the host found in the locality, it is difficult to determine exactly what percentage of the borers in any generation are being killed by it. While collecting in the field, the author observed that about as many parasite puparia as host larvae were encountered, and the mortality of the corn borer larvae caused by these parasites must be very high. A total of 520 overwintering corn borer larvae were collected and from these 111, or 21.3 percent, were parasitized by *L. grisescens*. The parasitization of the borers collected at the parasite-release point (section 1) was 34.7 percent. The parasitization of all borers (413) collected within 1-1/2 miles of the release point (sections 1-9) was 24.9 percent, and the parasitization of borers collected 3 and 5 miles from the release point was 12.3 and 2.0 percent, respectively. The parasite has spread at least 5 miles since its release but has not yet increased enough to effect a high parasitization of the borer in the area more recently occupied by it.

Perkins, Erie County, Ohio:

Locality surveyed: A central circle (section 1) 1 mile in diameter with its center at the parasite-release point in Perkins Township, Erie County. The central circle was surrounded by a concentric ring (sections 2-9) 1 mile wide. Area surveyed, 7 square miles.

Two introduced parasites, Lydella grisescens and Eulophus viridulus Thoms., are established at the Perkins Township, Erie County, parasite-release point. The latter species is very scarce and only two host larvae parasitized by it were taken in the collections made. On the other hand, 29.5 percent of the corn borer larvae observed were killed by the tachinid. Borer mortality caused by this parasite was 61.2 percent for the hosts observed from the liberation point and 25.1 percent of those from the surrounding area.

Erie Township, Monroe County, Mich.:

Locality surveyed: A central circle (section 1) 1 mile in diameter with its center at the parasite-release point in Erie Township, Monroe County, Mich. The central circle was surrounded by a ring (sections 2-7) 1 mile wide. Area surveyed, 7 square miles.

The only exotic parasite reared from corn borer larvae collected in Erie Township at the close of 1942 was the tachinid Lydella grisescens. This fly had parasitized 34.1 percent of the host insects collected from the parasite-release point and 27.2 percent of the borers observed from the surrounding area. The average borer parasitization determined for the locality was 28.3 percent, and was credited to the introduced species. One specimen of an undetermined native parasite was reared from the borers collected.

Toledo, Ohio:

Locality surveyed: Area located close to the shore of Lake Erie east of Momeneetown and west of Bono, in Jerusalem Township, Lucas County. It covers 12 square miles, being 6 miles long and 2 miles wide, the long axis paralleling the lake front.

An average of 24.6 percent of the borers collected in this area were killed by Lydella grisescens. At the close of 1941 the percentage of observed borers parasitized by L. grisescens in the same area was 19.6 percent. Approximately 66.9 percent of the tachinid parasites noted had issued from their hosts before the collections were made. It is of interest to note that for the six collections made nearest the marshland bordering Lake Erie, parasitization by L. grisescens was 37.8 percent, while for the six collections made at an average of only 1 mile farther from the lake shore, parasitization of the observed borers was only 9.7 percent.

The exotic chalcid Eulophus viridulus was recovered from 6 of the 12 collections. An average of 1.5 percent of the borers were killed by it.

The Corn Belt:

Limited collections were made at three localities (Wildcat Township, Tipton, Ind.; Grant Township, Vermilion County, Ill.; and Wilson Township, Sheboygan County, Wis.) at the close of 1942 to check for possible initial establishment of parasites released the same season. The results were all negative, no introduced parasite being recovered from any of the three localities.

